88. (Twice Amended) A method of operating an exposure apparatus to transfer a pattern on a mask onto a substrate, the apparatus having a projection optical system, a first stage that is movable along a first direction with respect to the projection optical system, and a second stage that is movable along the first direction with respect to the first stage, the second stage mounting one of said mask and said substrate thereon, the method comprising the steps of:

driving the first stage in the first direction; and

driving the second stage in the first direction to prevent a positional error between said first stage and said second stage at least when the first stage is being at least one of accelerated and decelerated, a size of the second stage being smaller than a size of the first stage.

REMARKS

Claims 26-94 and 97-104 are pending. By this Amendment, claims 38, 59, 66, 71, 76 and 88 are amended. The attached Appendix includes marked-up copies of each rewritten claim (37 C.F.R. §1.121(c)(1)(ii)).

The claims are amended to even more clearly distinguish them over the applied references.

Applicant notes with appreciation the allowance of claims 26-37. Applicant respectfully submits that all pending claims are in condition for allowance for at least the reasons set forth below.

Claims 38-45, 54-94 and 97-104 stand rejected under 35 U.S.C. §103(a) over U.S. Patent No. 5,477,304 to Nishi in view of U.S. Patent No. 4,916,340 to Negishi. This rejection is respectfully traversed.

With respect to independent claim 38, while Nishi discloses that a reticle side fine adjustment stage 21 of a guideless stage is driven in X, Y and θ directions, the actuator that

does such driving is not an electromagnetic actuator as recited in independent claim 38. While Negishi discloses electromagnetic actuators, Negishi discloses that the X stage 11, which is guided by a Y stage, is driven by an electromagnetic actuator in the X direction. Thus, neither Nishi nor Negishi discloses or suggests the claim 38 arrangement in which a second stage, which is movable in a first direction and in a direction perpendicular to the first direction with respect to a first stage (for example, in X and Y directions), is a guideless stage having no associated guide member to guide its movement, and is driven by an electromagnetic actuator. Accordingly, independent claim 38 and its dependent claims 39-45 are patentable over Nishi and Negishi.

With respect to independent claims 54, 59, 66, 71, 76, 83 and 88, and as previously argued, neither Nishi nor Negishi discloses or suggests the combination of features recited in these claims. The Office Action continues to rely upon col. 13, lines 28-60 of Nishi as allegedly teaching that the second stage is driven while the first stage is accelerated or decelerated. Applicant respectfully submits that the Office Action is in error. Col. 13, lines 32-35 of Nishi expressly states "while the reticle 7 and the wafer 14 are driven at constant speeds, respectively, the coordinate positions of the reticle 7 and the wafer 14 can be easily and quickly corrected" (emphasis added). Similarly, at col. 13, lines 56-58, Nishi states that "positional control of the reticle side fine adjustment stage 21 hardly affects the constant speed scanning operation of the reticle side scanning stage 20" (emphasis added). The scanning stage 20 of Nishi is not being accelerated or decelerated when it is being scanned at a "constant speed." Accordingly, contrary to what is stated in the Remarks portion of the Office Action, Nishi does not disclose or suggest that the second stage is driven and controlled as claimed while the first stage is accelerated or decelerated. Negishi does not overcome this deficiency of Nishi.

Accordingly, the references do not disclose or suggest driving the first actuator to prevent a positional error of the mask at least when the second actuator is being at least one of accelerated and decelerated, as recited in independent claims 54 and 83. The references also do not disclose or suggest driving a second stage to prevent a positional error between the first and second stages when the first stage is being at least one of accelerated and decelerated, as recited in independent claims 71, 76 and 88. Furthermore, the references do not disclose or suggest driving a fine adjustment stage to prevent a positional error between the scanning stage and the fine adjustment stage at least when the scanning stage is being at least one of accelerated and decelerated, as recited in independent claim 59. Lastly, the references do not disclose or suggest the claimed actuator that drives the second stage at least when the first stage is being at least one of accelerated and decelerated, as recited in independent claim 66. Additional sections or Nishi, referenced in Applicant's January 2, 2002 Amendment, further support Applicant's analysis of Nishi. When considered as a whole, Nishi does not disclose or suggest the above-noted features of the independent claims. Accordingly, claims 54, 59, 66, 71, 76, 83 and 88, as well as their dependent claims, are patentable over Nishi and Negishi.

Claims 46-53 stand rejected under 35 U.S.C. §103(a) over Nishi in view of U.S. Patent No. 5,623,853 to Novak et al. This rejection is respectfully traversed.

As previously argued, neither Nishi nor Novak et al. discloses or suggests providing a cooling unit that cools the actuators of a fine adjustment stage by circulating a cooling fluid from the actuators arranged in the direction perpendicular to the scanning direction. While it may be true that Novak discloses cooling coils, the coils of Novak et al. do not drive a fine adjustment stage. Moreover, the cooling takes place in the base of Novak et al., as is clear from the portions of Novak et al. referenced in the Office Action. Thus, Novak et al. is redundant to Nishi, which also discloses cooling the actuators that are used adjacent to the

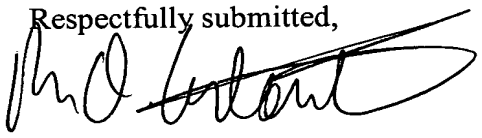
base. See, for example, col. 9, lines 19-23 of Nishi. Thus, Negishi does not add anything to the teachings of Nishi, which the Office Action acknowledges does not disclose or suggest cooling the actuators for the fine adjustment stage.

Accordingly, claims 46-53 also are patentable.

In view of the foregoing, Applicant respectfully submits that this application is in condition for allowance. Favorable consideration and prompt allowance are earnestly solicited.

Should the Examiner believe that anything further would be desirable to place this application in even better condition for allowance, the Examiner is invited to contact Applicant's undersigned attorney at the telephone number set forth below.

Respectfully submitted,



Mario A. Costantino
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MAC/ccs

Attachments:
Appendix
Petition for Extension of Time
Request for Continued Examination

Date: August 12, 2002

MAC:
OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

DEPOSIT ACCOUNT USE AUTHORIZATION
Please grant any extension necessary for entry;
Charge any fee due to our Deposit Account No. 15-0461

APPENDIX

Changes to Claims:

The following is a marked-up version of the amended claims:

38. (Three Times Amended) A stage apparatus comprising:

a first stage that is movable linearly in a first direction;

a second stage that is movable in said first direction and in a second direction perpendicular to said first direction with respect to said first stage, said second stage is a guideless stage having no associated guide member to guide its movement;

a first electromagnetic actuator that drives said second stage with a second thrust in said second direction with respect to said first stage; and

a second electromagnetic actuator that is different from said first electromagnetic actuator to drive said second stage with a first thrust in said first direction with respect to said first stage, said first thrust being different from said second thrust.

59. (Twice Amended) A scanning exposure apparatus that moves a mask with respect to a projection optical system while illuminating said mask on which a transfer pattern is formed and synchronously moves a photosensitive substrate with respect to said projection optical system, thereby projecting and exposing said pattern on said mask onto said substrate through said projection optical system, comprising:

a base that holds the following elements;

a scanning stage that is movable, with respect to said base, along a first direction corresponding to a moving direction of said mask and said substrate;

a fine adjustment stage that is movable along the first direction with respect to said scanning stage, said fine adjustment stage mounting one of said mask and said substrate, and a size of said fine adjustment stage being smaller than a size of said scanning stage; and

an actuator that drives said fine adjustment stage to prevent a positional error between said scanning stage and said fine adjustment stage at least when said scanning stage is being at least one of accelerated and decelerated during a scanning exposure operation.

66. (Twice Amended) A stage apparatus comprising:

a first stage that is linearly movable in a first direction;

a second stage that is movable in said first direction with respect to said first stage, a size of said second stage being smaller than a size of said first stage; and

an actuator that drives said second stage in said first direction, said actuator driving said second stage at least when said first stage is being at least one of accelerated and decelerated, said actuator having a first portion connected to said first stage and a second portion connected to said second stage.

71. (Twice Amended) A stage driving method for driving, in a predetermined direction, a first stage that is arranged to be movable linearly in a first direction and for driving a second stage that is arranged to be movable at least in said first direction with respect to said first stage, comprising the steps of:

providing an actuator to drive said second stage, said actuator having a first portion connected to said first stage and a second portion connected to said second stage;

driving said first stage; and

driving said second stage to prevent a positional error between said first stage and said second stage at least when said first stage is being at least one of accelerated and decelerated, a size of said second stage being smaller than a size of said first stage.

76. (Twice Amended) A stage driving method for scanning an object that includes at least one of a mask and a photosensitive substrate, in a scanning exposure apparatus that illuminates said mask on which a transfer pattern is formed and scans said mask in a predetermined scanning direction and synchronously scans said substrate in a

direction corresponding to said scanning direction, thereby exposing said pattern onto said substrate, said method comprising the steps of:

driving a first stage in said scanning direction, said first stage being used for scanning one of said mask and said substrate; and

driving a second stage in said scanning direction by an actuator having a first portion connected to said first stage and a second portion connected to said second stage to prevent a positional error between said first stage and said second stage at least when said first stage is being at least one of accelerated and decelerated during said scanning exposure, said second stage being movable in said scanning direction with respect to said first stage, ~~and~~ said second stage mounting said object thereon, and a size of said second stage being smaller than a size of said first stage.

88. (Twice Amended) A method of operating an exposure apparatus to transfer a pattern on a mask onto a substrate, the apparatus having a projection optical system, a first stage that is movable along a first direction with respect to the projection optical system, and a second stage that is movable along the first direction with respect to the first stage, the second stage mounting one of said mask and said substrate thereon, the method comprising the steps of:

driving the first stage in the first direction; and

driving the second stage in the first direction to prevent a positional error between said first stage and said second stage at least when the first stage is being at least one of accelerated and decelerated, a size of the second stage being smaller than a size of the first stage.